TABLE 3.—*Free-air resultant winds (meters per second) based on pilot balloon observations made near 7 a. m. (E. S. T.) during February, 1931*—Continued.

Altitude (meters) m. s. l.	Memphis, Tenn. (145 meters)		Modena, Utah (1,665 meters)		New Orleans, La. (25 meters)		Omaha, Nebr. (299 meters)		Phoenix, Ariz. (356 meters)		Royal Center, Ind. (225 meters)		Salt Lake City, Utah (1,294meters)		San Francisco, Calif. (8 meters)		Sault Ste. Marie, Mich. (198 meters)		Seattle, Wash. (14 meters)		Spokane, Wash. (606 meters)		Washington, D. C. (10 meters)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°	
Surface	N 63 E	0.4	N 69 W	0.2	N 65 E	0.9	S 51 E	1.1	S 76 E	2.8	S 88 W	0.4	S 55 E	0.5	N 80 E	1.2	N 61 W	0.5	S 38 E	0.9	S 12 E	1.0	N 24 W	1.0
500	N 36 W	1.4	------	---	S 59 E	2.0	S 19 W	1.6	S 73 E	2.6	N 63 W	3.3	------	---	N 11 E	1.6	N 9 W	1.6	S 2 W	4.7	------	---	N 46 W	5.9
1,000	N 45 W	4.0	------	---	N 84 W	2.2	S 78 W	3.6	S 48 E	0.7	N 48 W	5.3	------	---	N 3 E	1.9	N 34 W	5.0	S 20 W	4.4	S 2 E	2.5	N 52 W	8.3
1,500	N 41 W	5.8	------	---	N 68 W	3.5	N 76 W	5.1	S 19 E	1.5	N 60 W	7.4	S 37 E	1.0	N 47 W	1.0	N 33 W	6.0	S 35 W	4.8	S 36 W	3.7	N 56 W	11.0
2,000	N 51 W	5.8	N 32 E	1.6	N 73 W	4.2	N 62 W	5.7	S 11 W	2.2	N 62 W	8.9	S 3 E	2.1	N 16 W	3.5	N 32 W	8.4	S 22 W	4.4	S 49 W	3.4	N 50 W	10.9
2,500	N 38 W	5.6	N 53 E	1.8	N 58 W	4.4	N 68 W	6.2	S 40 W	2.6	N 64 W	8.9	S 31 W	1.8	N 18 W	5.3	N 39 W	11.7	S 50 W	3.4	S 54 W	4.0	N 51 W	12.2
3,000	------	---	N 8 W	1.4	N 82 W	6.2	N 70 W	7.8	S 76 W	2.5	N 74 W	8.2	S 77 W	1.4	N 34 W	5.4	N 41 W	11.2	------	---	S 72 W	4.0	N 59 W	11.0
4,000	------	---	N 59 W	4.7	------	---	N 76 W	8.8	N 88 W	4.9	------	---	S 53 W	3.8	------	---	------	---	------	---	S 23 W	4.0	------	---
5,000	------	---	N 34 W	7.4	------	---	------	---	------	---	------	---	------	---	------	---	------	---	------	---	------	---	------	---

TABLE 4.—*Observations by means of kites, captive and limited height sounding balloons during February, 1931*

	Broken Arrow, Okla.	Due West, S. C.	Ellendale, N. Dak.	Groesbeck, Tex.	Royal Center, Ind.
Mean altitudes, meters m. s. l., reached during month	2,822	2,636	3,193	2,492	2,852
Maximum altitude, meters m. s. l., reached	5,416	4,149	5,197	4,560	5,352
Number of flights made	28	30	26	19	27
Number of days on which flights were made	26	28	25	19	26

In addition to the above, there were approximately 176 scheduled pilot balloon observations made daily at 60 Weather Bureau stations in the United States.

WEATHER IN THE UNITED STATES

THE WEATHER ELEMENTS

By M. C. BENNETT

GENERAL SUMMARY

February was much warmer than normal in nearly all sections of the country. Along the Atlantic and Gulf coasts temperatures were near the average, but in Florida they were slightly below. In the Ohio Valley the month averaged from 4° to 8° warmer than normal, the central Mississippi Valley from 8° to 11° warmer, and from Iowa and Nebraska northward and northwestward, the plus departures were from 12° to more than 20°.

The precipitation during the month was very unevenly distributed. A large portion of the Southeast received less than half the normal. Light amounts fell also over a belt from the western lake region westward to South Dakota, and in much of the northern Rocky Mountain and the Pacific regions, while the northern portion of the Ohio Valley received from 60 to 75 per cent of normal. Generous amounts were received from southern Missouri, Oklahoma, and the central Rocky Mountain region southward, while the far Southwest received abnormally heavy rains.

TEMPERATURE

The temperature conditions were much like those of January just preceding, but usually February was still warmer than January had been. The first six days of February greatly resembled the last few of January, temperatures being below normal in parts of the Northeast, and about normal in Florida, while some cool weather occurred in the far Northwest; but for most of the country the warmth was noteworthy and very unseasonable, two stations in North Dakota averaging 34° warmer than normal for the week ending February 3.

A cold spell, not severe, appeared about the 8th in the far Northwest, yet was mainly of brief duration, save that after it had spread southward and eastward the southeastern portion of the country was mainly cooler than normal until about the 20th. Meantime, moderately cool weather had set in over the southern Plateau region. The last week was generally cooler than normal in southern sections from New Mexico to the south Atlantic coast, particularly in Texas; but central and northern sections had mild weather for the season all the second half of February, especially the districts between the Lakes and the northern Rocky Mountains.

While February as a whole was decidedly mild in most States, the temperatures were comparatively steady from day to day, with few new records established. The highest marks were generally noted about the 8th in the lower Mississippi Valley and in central sections east of that river, but on the 28th from Michigan and Ohio eastward; while west of the Mississippi River they occurred mainly during the first five days or about the 19th. The lowest readings occurred usually from the 7th in the Pacific Northwest to the 11th in the Atlantic and Gulf States; but in the middle and southern Rocky Mountain region and to westward at various dates.

Of the 37 States from the Plains eastward only 15 recorded temperatures below zero at any time during February, 1931.

Chart No. 1 shows the distribution of mean temperature with respect to the normal.

Much of the upper Missouri Valley found this the warmest February in the whole period of records, which at a few points exceeded 50 years in length.

For most of the central and north-central portions of the country the 3-month winter period, December, 1930, to February, 1931, averaged warmer than, or about equal to, the warmest other like period of record. At St. Paul, Minn., in a record covering 111 consecutive winters, only that of 1877–78 surpassed the mildness of the winter just ended.

PRECIPITATION

The fortnight from the 3d to the 16th was notable for heavy precipitation for the region over most of southern California and Arizona. During the same time well-distributed moderate to heavy rain reached most of the near Southwest, the central valleys and the southern drainage of the Ohio River. Several scattered areas received much precipitation during the last three days of the month.

February, as a whole, brought considerably more moisture than January had, yet for more than half of the country there was less than normal. In many eastern and central districts the precipitation was well distributed through the month and fell at a gentle to moderate rate, the soil thus getting great benefit for the quantity.

The inset on Chart No. V shows the monthly distribution with respect to the normal.

At Cairo, Ill., and Springfield, Mo., the monthly amounts were greater than normal for the first time since January, 1930.

The precipitation of the past winter (December to February, inclusive) is noted as the least of any winter of record at several places in the north-central portion of the country; likewise at some localities in northern California.

SNOWFALL

The snowfall was usually light for February, save in a few States. The middle and southern portions of the Rocky Mountain area mainly had more than normal, while from central North Dakota eastward to New England, the more northern States usually had from one-half to seven-eighths of normal amounts.

The snowfall was light and largely negligible over the southern half of the Middle Atlantic States, practically all of the Ohio Valley, the middle and much of the upper Mississippi Valley, and almost all the Plains. Most of Montana received but very light snowfall, while the Plateau and Pacific States nearly everywhere received much less than normal. When February ended, the stored snow in the elevated portions of the West was in almost every area less than the average quantity and in several States about as little as had ever before been noted at this time of year.

SUNSHINE AND RELATIVE HUMIDITY

Throughout much of the East and Southeast, and the northern portions of the Great Plains more than the normal amount of sunshine was received during the month, while in the Southwest and central Rocky Mountain region and to the westward, much cloudy weather prevailed. Elsewhere, about the usual amount of sunshine was received. The relative humidity was below the normal generally in the Southeast, much of the East, the Missouri Valley and far Northwest, while in the Southwest and the central and southern portions of the Rocky Mountain and Plateau regions it was above normal. The plus departures were rather large in the far Southwest, as would be expected from the abnormal rainfall received in that region.

SEVERE LOCAL STORMS, FEBRUARY, 1931

[The table herewith contains such data as have been received concerning severe local storms that occurred during the month. A more complete statement will appear in the Annual Report of the Chief of Bureau]

Place	Date	Time	Width of path, miles	Loss of life	Value of property destroyed	Character of storm	Remarks	Authority
El Dorado, Kans.	6	10 a. m.	2			Heavy hail	Some damage to wheat; path 14 miles long	Official, U. S. Weather Bureau.
Toledo, Ohio	7	3 a. m.-1:15 p. m.				Ice	Minor damage to trees and wires	Do.
Iowa (southern)	7					Blizzard	Numerous automobile accidents; motor and rail transportation interrupted.	Do.
Canaveral Lighthouse, Fla. (near).	17				$8,000	Winds	4 fishing boats beached	Do.
Sealy, Tex.	28	7 p. m.	4		1,500	Hail	Crops injured	Do.

RIVERS AND FLOODS

By MONTROSE W. HAYES

There were no overflows of importance in February, 1931. In Georgia, especially during the latter half of the month, there was enough rain to cause pronounced rises in the rivers, but bankful stages were not reached and the rises were quite beneficial. Rains in southwestern Missouri and northwestern Arkansas were rather heavy on the 7th and 8th and caused bankful stages in the Black, White, and Petit Jean Rivers. In eastern Texas, also, there was enough rain to materially increase the volume of water carried by the rivers, and at a few places the Trinity overflowed very slightly, without causing any damage. Probably the rises of the greatest importance occurred in Arizona, and are reported by the official in charge of the Weather Bureau office at Phoenix as follows:

As a result of heavy rains in southern Arizona from the 11th to the 16th, flashy rises occurred at a number of places in tributaries of the Gila River and at headwaters of that stream. The Salt River at Phoenix attained a stage of 6.2 feet on the 15th and continued above flood stage, 5.0 feet, on the 16th, the stage on the morning of the 16th being 5.3 feet. The greater part of the water came from the Verde River, a tributary of the Salt. Very little water was received from the Salt, owing to the storage dams on that stream.

Heavy rains in the drainage area of the San Pedro, a tributary of the upper Gila, caused a considerable rise at Kelvin (a short distance below the Coolidge Dam), which reached a height of 6.5 feet on the 16th; after this there was a rapid fall. The flood stage at Kelvin is 5.0 feet.

As little water came from the Hassayampa River, and the greater part of that from the Agua Fria was impounded by the Pleasant Irrigation Dam, there was no marked rise in the lower Gila.

Two men were drowned in the Verde River by the overturning of a boat. Unusually heavy rain at Wellton, near Yuma, was followed by a rush of water from a "wash" near that place. A trestle and some of the roadbed of the Southern Pacific Railway were carried out, causing damage to the extent of about $30,000.

A table of flood stages and crests is given below.

In most of the Mississippi system low river stages still prevail. Usually, low February levels above Cairo are caused by ice, but in the winter just ending there has been less ice than is customary. At Sioux City, Iowa, the channel of the Missouri was not closed at any time. The Sioux City records extend to 1855, and at only one other time, in 1888–89, did the channel remain open through the winter. Early in February the ice had run out of the Missouri as far north as Chamberlain, S. Dak.

The following reports from officials in charge of Weather Bureau offices are considered of interest: